Jet Engine Test Facility
Exhaust Emission Control System

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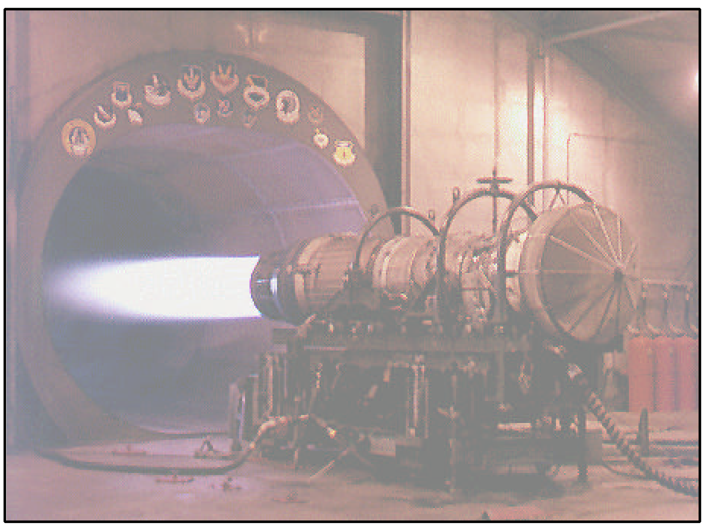
THE PROBLEM

Titles I and V of The Clean Air Act Amendments of 1990 set tough standards for emissions of air pollutants including nitrogen oxides (NOx), particulate matter smaller than 10 micrometers (PM_{10}), and carbon monoxide (CO). State implementation plans (SIPs) enforce these regulations, and require the Air Force and other DoD agencies to estimate, monitor, and sometimes decrease these emissions.

New standards for ozone (NOx is an ozone precursor) and particulate matter less than 2.5 micrometers ($PM_{2.5}$) promulgated in July 1997 are predicted to result in an increase from 106 to 335 ozone and $PM_{2.5}$ nonattainment areas. DoD facilities in nonattainment areas for ozone are estimated to increase from 90 to 187, while facilities in $PM_{2.5}$ nonattainment areas will increase from approximately 40 to 87. A significant source of NOx emissions result from stationary testing of jet engines. For example, Tyndall AFB, Florida, estimates that of its total emissions, jet engine testing accounts for 86% of NOx emissions (1995 actual emissions). An F100 engine in afterburner mode on a test stand at Tyndall AFB is shown below.



THE APPROACH

The Airbase and Environmental Technology Division (AFRL/MLQ) and its contractors, Sorbent Technologies Corporation and Applied Research Associates (ARA), Inc., have developed a system to capture NOx, VOCs, PM, and CO from jet engine testing. The system uses a vermiculite prefilter to capture fine particulate, followed by activated carbon filters to adsorb NOx, VOCs, and small amounts of CO. The activated carbon filters will adsorb 5--8 weight percent of NOx. When saturated, the activated carbon beds are drained, refilled with new carbon, and the used carbon is regenerated off-line for later reuse. Large blowers are required to offset filter back pressure. The power requirements for these blowers are the limiting factor in preventing favorable economics for application of the technology.

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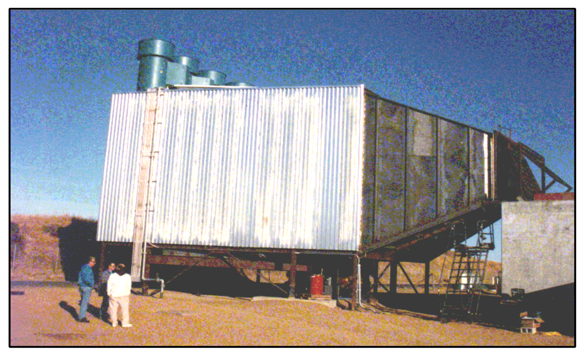
This filter technology, developed by Sorbent Technologies, AFRL/MLQE, and ARA, received a 1997 R&D 100 award from *R&D Magazine*, recognizing it as one of the most innovative products of 1997.

FIELD TESTS AND RESULTS

The prototype system designed and installed on Hushhouse #2 at McClellan AFB, California, is shown below:



The prototype system pictured processes a maximum of 300,000 standard cubic feet per minute (SCFM) of nonafterburner exhaust from the hushhouse. Flows from the hushhouse range from 200,000--2,000,000 SCFM from idle to full military power. The system captured an average of over 99 percent of the NOx and 89 percent of the fine particulate in the slipstream of nonafterburner exhaust from the jet engine test facility.

PAYOFF

For a jet engine test facility emitting 5--20 tons per year of NOx, a system to capture over 70 percent of the NOx would cost an estimated $50K--25K per ton of NOx. NOx credits are currently trading for $10K per ton in California, so economics are still unfavorable for application of the technology.

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